NON-PUBLIC?: N
ACCESSION #: 8909080090
LICENSEE EVENT REPORT (LER)

FACILITY NAME: Vogtle Electric Generating Plant - Unit 1 PAGE: 1 OF 05

DOCKET NUMBER: 05000424

TITLE: MANUAL REACTOR TRIP DUE TO FAILURE OF MAIN FEEDWATER ISOLATION VALVE
EVENT DATE: 07/08/89 LER #: 89-016-01 REPORT DATE: 08/31/89

OPERATING MODE: 1 POWER LEVEL: 100

THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR SECTION
50.73(a)(2)(iv)

LICENSEE CONTACT FOR THIS LER:
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NUCLEAR SAFETY AND COMPLIANCE MANAGER

COMPONENT FAILURE DESCRIPTION:
CAUSE: X SYSTEM: SJ COMPONENT: ISV MANUFACTURER: A391
REPORTABLE NPRDS: Yes

SUPPLEMENTAL REPORT EXPECTED: NO

ABSTRACT:

On July 8, 1989, at 0327 CDT, a manually initiated reactor trip occurred on Unit 1 with the reactor at 100% of rated thermal power. The manual trip was initiated because the Loop 4 Main Feedwater Isolation Valve (MFIV) failed closed resulting in a decrease in the No. 4 Steam Generator level. The plant was stabilized in Mode 3 following the reactor trip.

Troubleshooting following the manual trip failed to identify the exact cause of the spurious closure; however, two potential failure mechanisms were evaluated; solenoid failure and auxiliary relay failure.

Corrective actions for the July 8, 1989 event included troubleshooting of the valve control circuitry, repair of the associated handswitch for a problem noted during troubleshooting but unrelated to the failure, and continued control loop monitoring with a multi-channel recorder.

On August 3, 1989, the Loop 4 MFIV spuriously closed and the resulting

decrease in feedwater led the operator to trip the reactor at 1445 CDT. Control room operators achieved stable plant conditions by 1505 CDT.

Corrective action for this event consisted of replacing a failed solenoid valve and returning the valve to the vendor for failure analysis.

END OF ABSTRACT

A. REQUIREMENT FOR REPORT

This report is required per 10 CFR 50.73 (a)(2)(iv) because unplanned manual actuations of the Reactor Protection system occurred.

B. UNIT STATUS AT TIME OF EVENT

At the time of the event on July 8, 1989, Unit 1 was in steady state operation in Mode 1 (Power Operation) at 100% of rated thermal power. No unusual activities were in progress which could have contributed to the cause of this event.

At the time of the event on August 3, 1989, Unit 1 was operating in Mode 1 (Power Operation) at 100% of rated thermal power. Other than that described herein, there was no inoperable equipment which contributed to the occurrence of this event.

C. DESCRIPTION OF EVENT

On July 8, 1989 at 0327 CDT, a loop 4 Main Feedwater Isolation Valve (MFIV) Accumulator Gas (i.e. nitrogen) Low Pressure alarm was received in the Unit 1 main control room. Simultaneous with receipt of the alarm, a control room operator observed that the No. 4 MFIV handswitch indicated that the MFIV was not fully open based on dual handswitch indication. The operator immediately took the handswitch to the OPEN position but the No. 4 MFIV (1HV-5230) did not respond and continued to the fully closed position. This reduced feedwater flow to steam generator (SG) No. 4 to approximately 50%, provided through the bypass line. SG No. 4 water level started falling rapidly and in anticipation of the low level actuation setpoint, the Reactor Operator manually tripped the reactor. This occurred approximately 30 seconds after 1HV-5230 failed closed. By 0403 CDT, SG levels and reactor coolant temperature and pressure had been stabilized. The emergency operating procedures were then exited and unit operating Procedure 12006-C, "Unit Cooldown to Cold Shutdown" was entered.

After stabilizing the plant, an Event Review Team was established to investigate the event. Troubleshooting of 1HV-5230 was also initiated by Maintenance personnel. Troubleshooting activities included stroking 1HV-5230 in the slow open, slow close, fast close, and exercise modes of operation while monitoring the electrical operation of the solenoid valves and the output of the auxiliary relays associated with the hydraulic actuator. The MFIV stroked successfully and the control circuitry functioned properly during the investigation. Additional troubleshooting checked for loose connections, bared conductors, or other similar problems in the auxiliary relay cabinets, at the handswitch, and locally at the MFIV. The investigation revealed a problem with handswitch 1HS-5230B.

A plastic retainer for a spring associated with the slow close contact of the handswitch was found to be deformed and not properly restraining the spring. It was later determined that this condition would not have caused the event.

Unit 1 reactor was restarted after replacing the spring and damaged retainer with like components from another handswitch and fully instrumenting the valve actuation relays to enable pinpointing the failure should it happen again. The reactor was returned to Mode 1 operation at 2016 CDT on July 8, 1989.

On August 3, 1989 at 1444 CDT, a loop 4 MFIV Accumulator Gas (i.e. nitrogen) Low Pressure alarm was received in the Unit 1 control room. The Balance-of-Plant (BOP) operator observed that MFIV #4 (1HV-5230) had fast closed and attempted to re-open it with the handswitch, but was unsuccessful. Due to the reduced feedwater flow, SG #4 water level fell rapidly. In anticipation of reaching the low-low level reactor trip setpoint, the Shift Supervisor directed the Reactor Operator (RO) to manually trip the reactor at 1445 CDT. Main Feedwater isolation occurred and the Turbine Driven Auxiliary Feedwater (TDAFW) and Motor Driven Auxiliary Feedwater (MDAFW) pumps actuated as designed. Control room personnel throttled the Auxiliary Feedwater (AFW) flow and returned the SG water levels to normal. Stable plant conditions were achieved by 1505 CDT.

Corrective actions following the July 8, 1989 event included instrumenting the valve actuation relays with a multi-channel strip chart recorder to enable pinpointing the failure should it recur. Initial review of the August 3, 1989 trip data centered on the multi-channel strip chart voltage recorders. However, the results of this review were inconclusive. At this point, investigators found that

the coil to solenoid valve 1HY-5230A was cold to the touch when it had been confirmed that power was available to the coil and it should have been energized and warm. This solenoid controls the actuator to 1HV-5230 so that solenoid failure will cause the actuator to shut 1HV-5230.
Work orders were initiated to test the solenoid and associated auxiliary relays. Upon implementation of the investigative work orders, personnel identified that the 1HY-5230A solenoid coil was now warm to the touch and that valve 1HV-5230 would open. A decision was made to replace this solenoid and perform functional testing. Additionally, the auxiliary relays, 5230AX5 and 5230AX6 were replaced as a precaution. Personnel replaced the solenoid, verified that sufficient actuator hydraulic pressure existed and successfully tested 1HV-5230 for slow close, slow open and fast close operation.

D. CAUSE OF EVENT

The direct cause of the July 8, 1989 event was the spurious closure of 1HV-5230. The root cause for 1HV-5230 failing closed is now believed to be the failure of the normally energized solenoid valve 1HY-5230A. Prior to the restart of the Unit 1 reactor, the cause was considered to be the previously described handswitch defect. However, subsequent review on July 10, 1989, of available data by the Event Review Team, indicated that the spurious closure of the MFIV had been a fast closure and not a slow closure. This indicated that the problem with the handswitch was not likely the contributing cause for the valve failure. An almost identical event occurred on April 24, 1988 which also involved a spurious closure of 1HV-5230 and a manual reactor trip (reference LER 50-424/88-013).

The direct cause of the August 3, 1989 event was the spurious closure of valve 1HV-5230. The cause for 1HV-5230 closing was the failure of the normally energized solenoid valve 1HY-5230A. Failure of this solenoid valve allowed the 1HV-5230 actuator to move the MFIV into its safe (fail close) position.

E. ANALYSIS OF EVENT

The fail-safe position for a MFIV is the closed position. Also, accident analysis of a loss of normal feedwater indicates that the AFW system is capable of removing the stored and residual heat of the primary water system. Therefore, the plant safety and the health and safety of the public were not adversely affected by these events.

F. CORRECTIVE ACTIONS

1. Troubleshooting of 1HV-5230 and its control circuitry was accomplished as previously described prior to the restart of the Unit 1 reactor. The damaged spring retainer and spring associated with the 1HS-5230B handswitch was replaced as a result of this troubleshooting.

2. A multi-channel recorder was temporarily placed on both control circuitry trains for 1HV-5230 to monitor auxiliary relay output voltage.

3. Solenoid 1HY-5230A was replaced. Auxiliary relays 5230AX5 and 5230AX6 were replaced as a precautionary measure. The failed solenoid was disassembled and inspected and sent to the valve vendor for failure analysis.

G. ADDITIONAL INFORMATION

1. Failed Component Identification

Anchor Darling 16" x 12" x 16" - 900# Double - Disc Gate Valve with Anchor Darling Hydraulic Actuator Serial No. E9000-1-4

Solenoid Valve - Skinner Electric Valve Division Part No. V5H65590

2. Previous Similar Events

A similar event occurred on April 24, 1988 which also involved a spurious closure of 1HV-5230 and a manual reactor trip. This prior event was reported by LER 50-424/88-013. The cause of this event was solenoid valve 1HY-5230A failure. The additional corrective action discussed above (failure analysis of the failed solenoid) may lead to recommendations for actions to prevent recurrence of solenoid failures.

3. Energy Industry Identification Systems Codes

Main Feedwater System - SJ
Auxiliary Feedwater System - BA
Primary (Reactor Coolant) System - AB

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W. G. Hairston, III August 31, 1989 ELV-00731
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Docket No. 50-424

U. S. Nuclear Regulatory Commission
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Gentlemen:

VOGTLE ELECTRIC GENERATING PLANT
LICENSEE EVENT REPORT
MANUAL REACTOR TRIP DUE TO FAILURE
OF MAIN FEEDWATER ISOLATION VALVE

In accordance with 10 CFR 50.73, Georgia Power Company hereby submits the enclosed revised report related to events which occurred on July 8, 1989 and August 3, 1989. Due to the similarity of the two events, the August 3 event is being reported as a revision to LER 50-424/1989-016.

Sincerely,

W. G. Hairston, III

WGH,III/NJS/gm

Enclosure: LER 50-424/1989-016-01

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